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Differences in fish feed composition influence protein expression in the pyloric caeca in rainbow trout

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Aim

To investigate protein expression changes in fish gut (pyloric caeca) due to differences in feed composition.

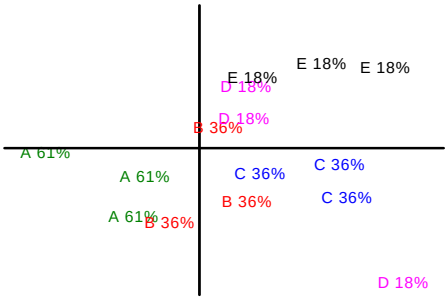

Figure 1: Principal component analysis of all 440 spots. The five different groups A,B,C,D and E are each represented by 3 samples. The first two principal components account for 33% of the variation within the samples.

Spot no.	Protein name	Function
1-11	Serum albumin	Blood plasma
12-13	Albumin	Blood plasma
14	carboxylic ester hydrolase	Enzyme
19	Selenium-binding protein 1	Protein transport
20	Flavodoxin	Electron transport
21	α-1-antiproteinase-like protein	Enzyme inhibitor
24	Aminoacylase-1	Hydrolysis
25-26	Glyceraldehyde-3-phosphate dehydrogenase	Glycolysis
27	Probable aminopeptidase	Digestive enzyme
28	Carboxypeptidase A1	Protein cleavage
29, 35-36	Unnamed Protein	
30	Transferrin	Iron Binding
31	Trypsinogen	Digestive enzyme
32-33	Superoxide dismutase, mitochondrial precursor	Oxidative stress
37	Cystathionine gamma-lyase	Enzyme regulation
38	Cu/Zn-superoxide dismutase	
39	Complement C3	Complement system
40	Fatty acid binding protein	Fatty acid transport

Table 2: MS/MS based protein identification of spots from figure 2. Methods: Additional gels with increased amounts of proteins were run for identification using Maldi TOF/TOF. The MS/MS data were subjected to peptide mass search using MASCOT to search against all entries in NCBInr.

Background: A continuous access to fish feed is a fundamental requirement of the aquaculture industry. Fish meal has traditionally been the main protein source in fish feed, but is now in short supply. Changing to other protein sources will however influence traits like fish growth, quality, and feed utilization. This investigation was initiated to clarify if changes in feed composition induces changes in the protein expression of the gut that might relate to changed traits.

	Feed A	Feed B	Feed C	Feed D	Feed E
Fish meal	61%	36%	36%	18%	18%
Pea protein				18%	18%
Blood meal			8%		8%

Table 1: The main protein source in percentage of feed in the five types of fish feed.

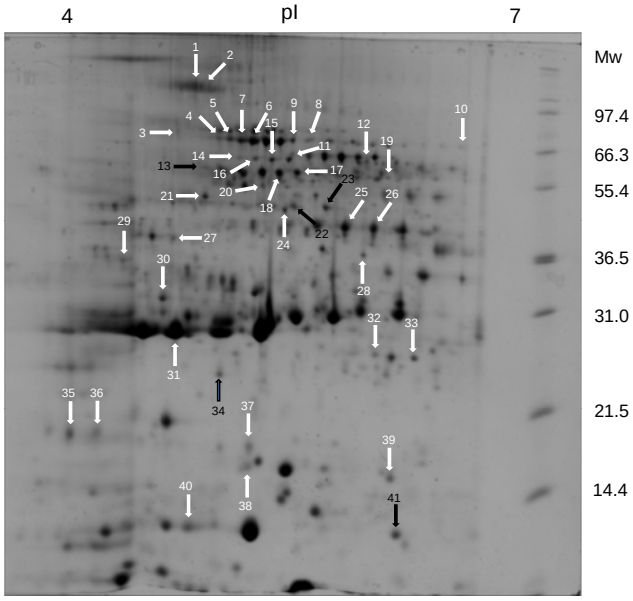

Figure 2: Representative 2-DE gel of proteins from the pyloric caeca from rainbow trout. Proteins of interest based on ANOVA and PLS analysis are indicated by arrows. White arrows designate that the protein has been identified with LC-MS/MS while black arrow designates that the protein have not been identified.

Conclusion

Fish feed influences protein abundance in the pyloric caeca. A number of digestive enzymes were among the affected proteins.

Differences in fish feed composition affects gastrointestinal blood flow, as indicated by differences in plasma proteins.